MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

HHG1011 – BASIC HUMAN GENETICS

(All section / Groups)

14 March 2019
9:00am – 11:00am
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **5** printed pages including the cover page with **5** questions only.
2. Attempt all **FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the **Answer Booklet** provided.

QUESTION 1

A. Many cells, including prokaryotes, possess internal circular double-stranded pieces of DNA that exist outside the typical genome and somewhat autonomously in the protoplasm. Name this type of DNA. **[0.5 mark]**

B. Name TWO evolutionarily significant benefits of meiosis that are not present in mitosis. **[2 marks]**

C. An organism has a diploid chromosome number of six. Two chromosomal pairs are telocentric, the other pair is metacentric. Assume that the sex chromosomes are morphologically identical. Draw chromosomes as you would expect them to appear at the following stages:

i. Primary oocyte (metaphase) **[1 mark]**

ii. Secondary spermatocyte (metaphase) **[1 mark]**

iii. First polar body (metaphase) **[1 mark]**

D. Figure 1 shows the stage of embryonic development. Paraphrase which stage is blastocyst and gastrula. Briefly explain the event form blastocyst and gastrula during embryonic development.

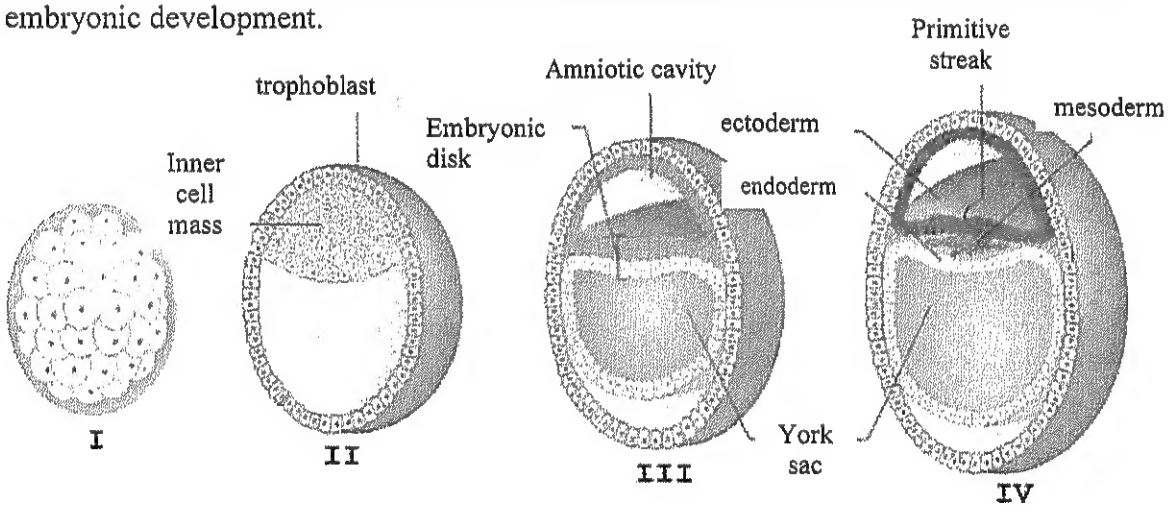

Figure 1 **[3 marks]**

E. What is the name of a normal gene that serves to promote cellular division? **[0.5 mark]**

F. Do identical twins can be a boy and a girl? Explain your answer in brief. **[1 mark]**

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QUESTION 2

A. Missense mutation is the most cause of many hemoglobin disorders such as sickle cell anemia and thalassemia. Briefly explain how these two hemoglobin disorders different in their inheritance pattern. **[2 marks]**

B. Fragile-X syndrome is the most common form of inherited mental retardation in humans. It happens because of strand slippage during DNA replication. What is strand slippage phenomenon? Briefly explain how it occurs. **[2 marks]**

C. Environmental factors play an important role in type 1 diabetes. Name TWO environmental risk factors involved in type 1 diabetes. **[2 marks]**

D. Suggest FOUR activities you can do to stay healthy and avoid the cardiovascular diseases? **[2 marks]**

E. Why is restriction fragment length polymorphism (RFLP) analysis useful in determining evolutionary relationships? **[2 marks]**

QUESTION 3

A. Double-stranded nucleic acids are said to be antiparallel. What structural configuration is antiparallel? **[1 mark]**

B. Histones play a major role in exposing DNA for transcription. Briefly explain the inactivation of histone during chromatin remodeling process. **[2 marks]**

C. How do tumor virus transform cell cycle control pathways? **[1.5 marks]**

D. List THREE abnormalities involving aneuploidy of X chromosomes. **[1.5 marks]**

E. Retinoblastoma is the most common eye tumor in children. The incidence of cancer falls into two categories; the familial form of retinoblastoma and the sporadic form of retinoblastoma. Distinguish these two forms of retinoblastoma. **[2 marks]**

F. Briefly define what is meant by *gene therapy*. **[1 mark]**

G. How are gene therapy and recombinant DNA technology related? **[1 mark]**

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QUESTION 4

A. What is meant by the term *heritability*? Of what interest is heritability to animal and plant breeders? **[2 marks]**

B. Interpret the meaning of an H^2 value (broad-sense heritability) that approaches 1.0. **[1 mark]**

C. Describe the value of using monozygotic twins in the studying the relative impact of heredity versus environment. **[2 marks]**

D. Describe the variation in inheritance for tongue rolling ability? **[0.5 mark]**

E. A small part of the human Y chromosome contains the gene that is responsible for determining maleness. What is the name of this gene? **[0.5 mark]**

F. Under what condition might a human female have the XY sex chromosome complement? **[1 mark]**

G. The white-eye gene in *Drosophila* is recessive and sex-linked. Assume that a white-eyed female is mated to a wild type male. What would be the phenotypes of the offspring? **[1 mark]**

H. Name FOUR models of inheritance which are influenced by the sex of individuals. **[2 marks]**

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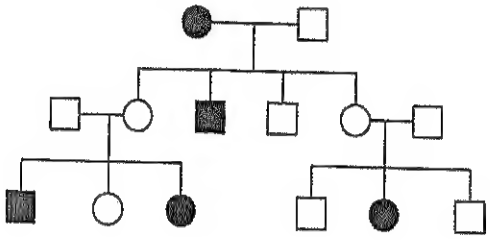
QUESTION 5

A. The following F2 results occur from a typical dihybrid cross:

purple:	*A_B_*	9/16
white:	*aaB_*	3/16
white:	*A_bb*	3/16
white:	*aabb*	1/16

If a double heterozygote (*AaBb*) is crossed with a fully recessive organism (*aabb*), what phenotypic ratio is expected in the offspring? What is the probability of having homozygous recessive from this cross? **[2 marks]**

B. What pattern of inheritance is shown in the following pedigrees?



[1 mark]

C. Human being carrying the dominant allele T can taste the substance phenylcarbamide (PTC). In a population with the frequency of this allele is 0.4, estimate the probability that a particular taster is homozygous. **[3 marks]**

D. Briefly explain the role of natural selection which contributes in changing allele frequency. What might happen if a well-adapted population experienced sudden major changes in its environment? **[1 mark]**

E. Prenatal detection of human diseases has been greatly enhanced by two procedures. Name and briefly describe each procedure. **[2 marks]**

F. A patient's response to a drug may depend on pharmacokinetic and pharmacodynamic factors. Distinguish between this two factors. **[1 mark]**

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